



With Compliments of the Author

— ON —

CONSUMPTION

ITS CAUSES AND

PREVENTION

— IN —

MAN AND ANIMALS

— BY —

EDWARD PLAYTER, M. D.,

EDITOR OF THE "SANITARY JOURNAL," AUTHOR OF ELEMENTARY PHYSIOLOGY
AND HYGIENE (AUTHORIZED BY THE EDUCATION DEPARTMENT), THE
LUNGS AND HOW TO PRESERVE AND STRENGTHEN THEM,
STATISTICAL REPORT ON CAUSES OF CONSUMPTION, &c.

—
NOVEMBER.
—

OTTAWA:
A. BUREAU, PRINTER.

1884.

disse
that
rela
vidu
is ex
seen
tion
univ
and
imp

look
thin
pow
beco
hesi
ordi
of c
able
the
beca
prac
the
liabl
or w

show
othe
the
Cana
of E
take

CONSUMPTION,

ITS CAUSES AND PREVENTION

— IN —

MEN AND ANIMALS.

INTRODUCTORY.

Tubercular consumption is such a terribly prevalent and fatal disease in almost every country in the world in both man and animals, that hardly any question can be of greater importance than that which relates to its prevention. It is a question which concerns every individual, of every age, high, low, rich and poor, almost alike, for no one is exempt from the disease and its influences. Moreover, the disease seems to be every where on the increase; which fact makes the question a still more serious one. Finally, the disease is now almost universally regarded by the medical profession as a preventable disease, and the subject of its prevention becomes one of very great practical importance.

A great many people, even amongst the more intelligent classes, look upon consumption, as they do upon many other diseases, as something to which human beings are so naturally subject that they are powerless in preventing it; yet, when once symptoms of its presence become manifested in the body of any one, there is not the slightest hesitation in at once resorting to means for its cure. Any one of ordinary intelligence who will examine into the now well known causes of consumption cannot fail to readily see that it is not only a preventable disease, but that it may be more easily and surely prevented than the more actively infectious diseases which prevail epidemically; because the prevention of consumption is, in each individual case, practically almost entirely in the hands of the individual, whereas, in the case of any one of the very infectious diseases any individual is liable to become infected from other persons who, through ignorance or wanton carelessness, may convey the infection of it to him.

THE MOST FATAL AND COSTLY DISEASE.

The record of deaths in the province of Ontario since the year 1870, shows that many more deaths are caused by consumption than by any other disease. It causes on an average more than one-tenth of all the deaths registered in the province. In the other provinces of Canada, in the United States and Great Britain, and on the continent of Europe, it causes from one-fifth to one-tenth of all the deaths which take place.

From the long period of debility, sickness and inability to work which invariably precede death from this disease, the actual money outlay which it causes in the country, aside from the deaths, is vastly greater than the costs of any other disease; the proportionate loss to communities from it, in comparison with other diseases, being much greater in relation to the sickness than to the deaths.

It is somewhat strange, considering the great fatality of this malady and the large proportion of sickness and of deaths it is continually causing in almost every civilized country, that more general attention has not heretofore been given by sanitarians to its prevention. Those interested in public health proceedings—in the prevention of sickness and premature deaths—have perhaps naturally enough bestowed their thoughts and time chiefly on those diseases which prevail epidemically and in a short period of time destroy many lives, or which, prevailing only endemically or to a much less extent, destroy life more rapidly—in a few days or a few weeks, while this dreadful disease—consumption, which is daily cutting off after months and years of almost hopeless suffering, vast numbers of lives—often the brightest, most useful, most valuable lives, has not received from practical sanitarians that practical consideration which its great importance demands.

THE DISEASE IN ANIMALS—ESPECIALLY COWS.

Tubercular disease may effect most of the domestic animals but more especially cows. There now appears to be hardly any doubt whatever that the tubercular disease in animals, in cows and oxen commonly known as the "pearl disease" (called by the Germans *Perlsucht*, from the grape shaped appearance of the tubercular masses), is absolutely identical with tubercular consumption in man. Prof. Schuppel, of Tubingen, who has made a special and very thorough study of this subject, is one of the greatest authorities in favor of this view. And not only is the disease thus identical, but there is the strongest evidence that it may be communicated from animals to man. Hence, especially, the great need of more widespread information regarding the nature of the disease and the means of preventing it.

In the ninth annual report of the Agricultural College and Experimental Farm, Guelph, Ontario, it is stated that, "The extent to which this disease exists amongst the better breed of cattle in this country is alarming, for many reasons; not the least one of which is the danger to which the public are exposed from the consumption of meat from such animals. From an economic stand point the outlook is serious, as the annual loss must be very great, and will continue to become greater as long as so little care is observed in the selection of healthy dams and sirs."

George Fleming, F. R. G. S., &c., &c., in his Manual of Veterinary Science, vol. ii, says: "Tubercular Phthisis probably prevails among the domesticated animals over the entire globe, though its frequency will depend upon various external influences, as well as upon the constitutional tendencies of different species and breeds. In some countries it is enzootic and very destructive. Such is the case in densely populated districts and in unhealthy climates, or in regions where animals are improperly fed and housed. In Mexico, for instance, it is very common, and causes much loss, about thirty-two per cent of the animals slaughtered for food being found affected. In Europe particularly, in the

cow-sheds of the large towns and cities, it is extensively prevalent; and in this country [Eng.] it has long been recognized as a common disorder among animals, but more especially as effecting the bovine species.

"The greatest importance at present attaches to this disease, from the fact that it has been induced experimentally in a considerable number of animals of different species—carnivores, herbivores, and omnivores—by inoculating and feeding them for a certain period with tubercular matter from the lungs and glands of diseased subjects, as well as their milk. When we consider how extensively this condition prevails among cattle whose milk is consumed as an article of diet—and particularly in rearing infants, and whose flesh is used as food, no matter how diseased they may have been, it becomes a serious question whether there may not exist the gravest reasons for interdicting, wholly or partially, the utilization of the milk and flesh of animals so affected.

In his work on the contagiousness of consumption, Dr. Clapp, of Boston, writes: "We are forced to admit, from abundant evidence, that such animals [the bovine species] are more often affected than is generally thought, and that quite a large percentage of cows which have been kept in badly constructed sheds and milked freely, are affected with the disease." Dr. A. N. Bell, of Brooklyn, N. Y., in the *Sanitarian* for August 1877, reported that he had examined the carcasses of eleven cows that had died, it appears, in Brooklyn, and that ten had "evidently died of tuberculosis of the lungs. The other one, which also had the disease incipiently, died in first calf-birth. One of them was of a choice breed, imported at a cost of about \$500; she had been carefully kept in a small, dark, and close stable, and allowed but a little exercise."

Recent investigations show that consumption in birds is identical with that in man. The common fowl, pigeon, partridge, and other seed or grain eating birds are most liable to the disease.

NATURE AND CHARACTERISTICS OF THE DISEASE.

This disease is one of imperfect nutrition, and is characterised by the deposition in the lungs and other organs of what is called tubercular matter, with wasting of the tissues. In animals, it invariably, it appears, terminates fatally. Usually its progress is slow and its commencement insidious.

The tubercle when recently formed is a little nodule, usually spherical when isolated, varying in size from a very minute point to that of a millet seed. It is usually dense, tenacious, and difficult to crush or tear; at first grayish white, and semi-transparent, but when fully developed it is of a somewhat yellow color, and opaque. Large masses are formed by the aggregation of these miliary masses. In the progress of the disease the lung tissues seem to gradually waste away and be replaced by this morbid product. From the recent investigations of Dr. Robert Koch, a German physician, it appears that the disease is caused by the entrance into the body, and the development and multiplication therein, of minute parasitic organisms, classed amongst the lowest forms of organic life, called *bacilli* (small sticks). They are about $\frac{1}{100}$ of an inch in length, mostly straight, with rounded ends. They have a beaded appearance, the number of beads averaging about six to each rod, thus indicative of sporing, a process by which they multiply with

marvelous rapidity. These organisms, from the sputa of men suffering from the disease, and from other sources, have been cultivated in certain fluids, as ox-blood serum, and the bacilli thus cultivated or grown introduced into the bodies of various animals, as rabbits and guinea-pigs, and the disease thereby set up in them; the disease being characterised by the usual progressive formation of tubercular nodules, which probably consist chiefly of disintegrated tissue cells, and always contain the characteristic bacilli. Tuberculous matter, in later stages of this disease, may become softened and easily broken down by the fingers, like a piece of cheese, and is then called caseous tubercle. Still later, it may become quite soft and creamy in consistence.

During the progress of the disease the tubercular masses sometimes become so numerous and developed in the bovine species as to increase the lobules of the lungs to thrice, and even five times, their natural weight—the diseased organs sometimes weighing from forty to sixty pounds. The liver, spleen, kidneys, and various other glands, and the intestines, frequently contain large deposits of tubercular matter. The muscles or flesh are rarely affected in this way.

“The insidiousness of the malady at its commencement in animals (Fleming’s Vet. Sci.) renders its primary phenomena obscure and inappreciable, and it may have been in existence for months before the earliest external manifestations can be fixed upon. As Reynal points out, those who are in the habit of visiting slaughter-houses will often have occasion to note the presence of tubercles in the lungs of cattle which, during life, would not have been suspected of suffering from an incurable malady. When living they must have appeared perfectly healthy, and have fattened as if nothing had been amiss with them..... Cattle kept solely for dairy purposes, and particularly in large towns, suffer by far the most severely from this affection.”

EARLY SYMPTOMS OF THE DISEASE IN COWS.

In view of the contagious nature of the disease, and the extreme probability, according to the best authorities, that it may be communicated to the human organism by means of the flesh and milk of animals affected with it, a few remarks here on the early symptoms of the disease in cows will be of practical value.

According to Fleming, the first perceptible signs are general dullness and indifference, and less activity and energy; with heightened sensibility of the skin, especially over the withers, back and loins, manifested by marked shrinking of the animal if these parts be pinched. There is exaggerated sexual desire—marked by continual or frequent periods of rutting: such animals being known as “bullers” (in France, as *taurelières*). They rarely breed, however, though they may now fatten or yield as much milk as if quite well. The milk is more watery, of a bluish tint, and less rich in nitrogenous matters, fat and sugar, but containing a larger proportion of alkaline salts. There is a dry, deep, though feeble cough, especially on exertion of the animal or on sudden change of temperature of the atmosphere, or on compression of the windpipe. There is not generally expectoration or nasal discharge, though at a later period exertion causes a flow of glairy mucus streaked with thick flakes. The walls of the chest become more sensitive on percussion, or thumping, and there is a duller sound. By placing the ear on the chest one may often hear, instead of the smooth respiratory murmur of air passing in and out the lungs, as in health, a harsh,

rasping or loud blowing sound, especially in some parts of the lungs. The heart's action is at times quicker and stronger; the skin, particularly toward the base of the horns and ears, is hot and dry; intermittent bleeding from the nose may take place; lameness too, and enlargement of the glands about the neck and elsewhere.

The above symptoms may continue, with little change, for months, but if no preventive or curative measures be adopted, the symptoms become intensified, and what is called the second stage of the disease is reached, and finally the third stage. "There is evident emaciation, and the animals are heavy, apathetic, and sluggish in their movements; while the countenance is without animation and dull, and the eyes are retracted in their orbits. The skin is harsh and dry, and adheres closely to the ribs, and the hair covering it is lustreless and staring and frequently damp. Exertion produces abundant perspiration and labored respiration, and so much lassitude and distress that the animal seeks to relieve itself by carrying the head close toward the ground." The appetite is poor and digestion weak, with diarrhoea, perhaps alternated with constipation. The cough becomes worse, and the breathing more frequent and difficult, and great emaciation and finally death follow.

CAUSES OF CONSUMPTION.

The causes of consumption may be best considered under three principal heads, viz: 1st, Heredity; 2nd, Contagion; and 3d, Personal habits and surroundings of life.

Probably in every case of consumption, causes which come under each one of these heads have taken part in the development of the disease—each in a degree, small or greater, according to circumstances. Some constitutional defect, especially in connection with the respiratory organs, has been inherited, it may have been from ancestors somewhat remote, or apparently so, and the defect may have been but slight at first and gradually developed and increased by the habits and environments of life; the specific contagion—the tubercle bacillus itself, it may be, is then received into the body from another case of the disease—for there can be hardly any doubt that the disease is contagious, and it appears very probably that the bacillus is the contagion; the condition of the body proves suitable for the development and multiplication of this contagion, and habits of life and environments favor its multiplication until it becomes as it were "master of the situation"—the human organism, divine, is overcome and its life destroyed by the microbe.

HEREDITY AS A CAUSE.

The influence of heredity in consumption appears to be greatly misunderstood, especially by many outside the medical profession. Consumption can hardly be regarded as hereditary in the same degree, or even in the way, that syphilis is. It seems improbable that there is anything more transmitted from parent to offspring than certain constitutional or organic defects in bodily construction, and these defects are probably chiefly in connection with the respiratory organs. It has been stated that in the inherited tubercular diathesis, the minute lymphatic vessels are smaller than in persons of sound vigorous constitutions; whether as cause or effect is not known. Might not the diminished caliber of these vessels be the result of imperfect respiratory capacity, with imperfect performance of the excretory function of the

lungs? Practically, this is a matter of comparatively little consequence. Beyond this, to be sure, it is probable that a mother suffering from the disease may communicate to her offspring in utero the actual specific contagium or tubercle bacilli. But this is not what is commonly understood when reference is made to the disease being hereditary.

The following extracts bearing upon heredity are deductions from a report on causes of consumption, compiled from answers, by medical practitioners, to a series of questions sent out by the writer about three years ago. These answers were based upon over 250 cases of well marked tubercular phthisis, in the human body, which came under the observation of these medical practitioners, in Canada and the United States.

"In causing consumption, in so far as configuration and structure of the body, and the relation, and the relative size and vigor of the different organs to each other, are influenced by parentage, hereditary influence becomes a very important factor. Indeed, heredity probably has no direct influence, especially after the period of early childhood, other than in this way.

"Man is made up of the characteristics and peculiarities, physical, mental and moral, of his ancestors; more largely of those of his parents than of his grand-parents. In organic life like produces like, and form, general structure, features, are, by the laws of life, transmitted from parent to offspring—subject, to be sure, to the influences of the conditions and circumstances by which one is surrounded. We can, therefore, but expect and look for constitutional organic defects to be transmitted from one generation to another.

"One of the most marked features, and perhaps the most important one, brought out in the analysis of the cases above referred to, is the evidence that those who die of the disease under consideration have a small pulmonary capacity—a small, contracted chest. This is shown not only in the average of the cases, but in every case; in not one did the circumference of the chest even approximate that of a well developed individual of the same height and weight.

"According to the best authorities, the circumference of the chest around or on a level with the nipples should be equal to one-half the height, plus one-fifteenth the height, of the individual. The circumference of the chest, therefore, of one whose height is 5 feet 5½ inches—the average height of the individuals in the cases reported upon—should be, according to that, at least 37 inches; whereas, the average circumference of the chest in these cases was only 31½ inches, or only about five-sixths of that demanded for health and good natural development. [The circumference varied from 25 to 36 inches].

"In about half the cases the chest was reported flat as well as small in circumference—a form giving still less capacity than a round chest with the same circumference. It may be fairly assumed that the average length or height of this cavity in these cases was not greater, if so great, as the length of it in well developed persons. True, in the larger proportion of cases the trunk was reported proportionately long, but most likely this length was owing to a long abdominal cavity, as in most of the cases the function of digestion appears to have been well performed, indicating well developed digestive organs.

"Now, as the size of the lungs is in exact relative proportion to the size of the chest—the lungs with the heart and its large trunk vessels just filling the cavity, and although it is possible that small lungs may be more highly organized than larger ones, in accordance with a principle

sometimes manifested in other organs—that the air cells in the smaller lungs may be, relatively, more numerous than in the larger ones, and so give a relatively greater respiratory surface, we have no evidence that this is the case, and though this condition might prevail to a certain and limited extent, there was, doubtless, in all these cases, a great want of capacity and power for the purposes of carrying on the important function of respiration—that by which oxygen is taken into the blood and the used up waste matters are given out. There would be, consequently, in such circumstances, besides want of stamina, a tendency to accumulations in the blood and other fluids of the body of waste, used-up matters, and frequently probably, too, of unassimilated though digested food.

"Furthermore, they had nearly all been small or moderate eaters, and had used but little fatty food except butter (most healthy people use besides butter a good deal of fat); they could not, in fact, seemingly, consume enough oxygen to utilize the digested products of a generous, full, or an ordinary diet, especially that containing much carbonaceous matter. They had, consequently, no natural desire for more than a small or moderate quantity of food. But few of them, as we find, suffered from indigestion; they could, for the most part, readily digest all the system could utilize with its small respiratory capacity—all there was a natural inclination for. It is frequently the case that persons predisposed in this way to pulmonary consumption have a desire for and will digest very indigestible foods, such as pastry and hot bread."

CONTAGION AS A CAUSE.

From the period of the earliest records in the history of medicine, the contagious nature of tubercular consumption has been believed in by physicians of the highest repute. Over two thousand years ago (400 B. C.), Hippocrates, the "father of medicine," believed in it. Aristotle (330 B. C.) wrote that the Greeks in his day believed in it; and he asks why consumption, "sore eyes" and itch are common to persons who associate with others suffering from these affections. Later (A. D. 180), Galen wrote that it is dangerous to pass the whole day with a consumptive person." Coming down to much more recent periods, Morton, over two hundred years ago, wrote of consumption that "a contagious principle often propagates this disease, for, as I have often found by experience, an affected person may poison a bed-fellow by a kind of miasm like that of a malignant fever." Riverius, about the same period of time, believed contagion to be the "chiefest" cause of consumption. "We may observe women to be affected by their husbands," he wrote, "and men by their wives, and all the children to die of the same, not only from infection of their parents seed, but from the company of him that was first infected."

The eminent Italian physician, Valsalva, a professor of Bologna, in the early part of last century, was himself predisposed to consumption, and avoided being present at dissections of the lungs of persons who had died of the disease. Valsalva's illustrious pupil, Morgagni, professor in the University of Padua, declared that he had never dared to make more than a few *post-mortem* examinations of persons who had died of this disease for fear of contracting it. A law once existed in Italy by which the proprietor of a house in which a consumptive had died could claim payment for his furniture, which was

burnt. It was often difficult there for a person supposed to be consumptive to obtain lodgings.

Over a century ago a reaction regarding belief in the contagiousness of consumption commenced to show itself. Eventually, in Northern Europe and America especially, doubt developed into general disbelief. In the warmer latitudes however the opinion favorable to contagion never lost its hold; and the reaction has probably paved the way to more rational and accurate views, based on modern scientific investigations, which will be generally accepted. Within a comparatively few years the belief that the disease is contagious has again become very general. The recent investigations of Kock have resulted in making belief in its contagiousness almost irresistible. If the bacilli are the cause of the disease, it can hardly be otherwise than contagious.

D. Wm. Buld, in an article on the nature and propagation of phthisis (*London Lancet*, Oct. 12, 1867), takes strong ground in favor of contagion. He concludes that "tuberculosis is a true zymotic disease of specific nature, in the same sense as typhoid, scarlet fever, typhus syphilis, etc., are; and that, like these diseases, tuberculosis never originates spontaneously, but is perpetuated solely by the law of continuous succession. The evidences of this he finds in,—(a) Considerations based on the pathology of phthisis, consisting in the evolution and multiplication in the organism of a specific, morbid matter, with a tendency to elimination, and casting off of the same, like zymotic diseases generally. (b) Actual instances in which there is evidence to show communication from one to another. (c) The geographical distribution of phthisis in past and present times, and especially its fatality now in countries which were entirely free from it when first discovered by Europeans. (d) Its greater prevalence in low levels and crowded communities, and entire absence, except by importation, at high levels—the same conditions which govern zymotic diseases. (e) Its high rate of prevalence in convents, harems, barracks, penitentiaries, etc., i. e., in the same social conditions known to propagate zymotic disease."

"As facts for his statement about geographical distribution (c), he adds that when the South Sea Islands were first discovered, there was no phthisis there; but that since the aborigines have come into contact with Europeans, the disease has become so wide-spread as to threaten their extermination. This is a striking contrast, only to be explained, he thinks, by the importation of a new and specific morbid germ. The late Dr. Rush, of Philadelphia, who made accurate inquiries, satisfied himself that there was no phthisis among the American Indians when America was discovered, whereas now it is very common and very fatal among them.

"Furthermore, in Africa, everywhere along the sea-board, where the blacks have come into constant and intimate relations with the whites, there has been a large mortality from the disease; but in the interior, where there has been only occasional contact with a few great travellers, the disease has not been found. Of this fact Dr. Livingston and other African travellers have given Dr. Budd positive assurance." ("Is consumption Contagious," &c., by H. C. Clapp, A. M., M. D., Boston.)

Dr. Bowditch, late chairman of the state board of health of Massachusetts, a number of years ago made some investigations relating to the cause of consumption, by sending a list of questions to prominent

physicians in active practice in several of the states and in "London and Germany (Fourth annual report of the state board of health, Mass, 1872). Of 210 physicians who replied, 28 did not answer the question on contagion. Of the remainder, 110 answered in the affirmative; 45 in the negative; and 27 were doubtful. Many besides answering "yes" or "no" wrote something like the following: "I am a firm believer that consumption is a contagious disease, much more so than is generally believed. I have in my mind several cases where there was almost positive evidence of contagion." "In very many cases, I have the opinion, from my own observation, that consumption is communicable by contagion or infection." "I am more inclined than I was at one time to attach importance to the influence of contagion." "I am thoroughly convinced that phthisis is frequently caused by contagion and deserves to be classed with typhoid fever in this respect. I have seen unmistakable evidence where a healthy wife contracted the disease from sleeping with her husband suffering from the disease, and *vice versa*."

In 1878, Dr. Holden of New Jersey, made some similar investigations. Out of 250 answers to a list of questions, 126 physicians answered "yes" in reply to the question on contagion, 73 of whom were emphatic, and gave cases in confirmation; 74 answered "no"; and 50 were doubtful or could not form an opinion.

Dr. Holden himself commenced practice, it is stated, with the idea that consumption was communicable only from parent to offspring, but at length wrote as follows: "I can enumerate at least a score of cases which have been watched with this very object in view and in which the result has been the same. Wives after husbands, husbands after wives, intimate companions and faithful nurses, who slept in the same bed, or wore the same clothing, have fallen victims. Of course, it is not to be intimated that all, or even a majority, can be affected by contagion any more than in those diseases now indisputably contagious. Malignant scarlet fever, diphtheria, and cerebro-spinal meningitis are braved by faithful nurses and friends, who escape in *more* than a majority of instances. To prove contagion now, is no easier than when the non-contagiousness of erysipelas had its defenders, and the records of the surgical wards of the hospitals of Paris, and Berlin, and London, had accumulated a fearful mortality ere the obturate prejudices of the profession were awakened to a new belief."

Dr. Clapp, of Boston, in a recent work ("Is consumption contagious" 1881), records the history of 25 cases, illustrative of the contagious nature of this disease, which he selected "from among those which can be found on record scattered through the annals of medical literature." In the history of the 25 cases, mention is made of 66 persons who became consumptive seemingly through contagion. 54 of these were distinctly stated to be free from hereditary taint, and of the others, "probably some would have been found to be likewise free if their family histories could have been obtained."

EVIDENCE OF CONTAGION AT HOME.

The following notes of a case in practice was reported by Dr. Wilson, of Richmond Hill, Ont., to the *Canadian Practitioner*, (Aug. 1883). It should be a warning to those employing nurses, as well as to others.

"B. W., aged four months; family history good, and no trace of phthisis or syphilis discoverable in either family. Had had no previous illness, was plump, fat, and well nourished. The mother was forced to wean the child when about a month old, and was confined to her bed, so that she could not attend to it, by cerebral anemia. The child was fed on cow's milk from a bottle, and thrived well for a time, having no digestive troubles. It was attended by a nurse, who was well advanced in consumption, and had free expectoration. The child slept with the nurse, who, by the way, was in the habit of keeping it close to her face during sleep, and consequently it was exposed to her breath for hours together. Nothing unusual was noticed in the child's condition for the first three or four weeks after the nurse's arrival, when it began to lose flesh and cough slightly. This cough and wasting gradually increased, and finally I was called in to see what was the matter with the child, and on examination I found well marked and far advanced phthisis, with frequent cough and great emaciation. The child died in its eighth month, or three months after the first symptoms were noticed, and four from the first attendance of the nurse. I may mention in connection with the above history that the same nurse, who has since died of consumption, attended five other children, and four out of the five died of some wasting disease, said to be similar to B. W., but as I did not see any of them I am unfortunately unable to state its nature."

Dr. J. E. Graham, lecturer on Medicine, dermatology &c., Toronto School of Medicine, in a paper read last year, at the meeting of the Ontario Medical Association, referred to many cases in practice strongly supporting the theory of a contagion in consumption. He thought it difficult to understand why distinguished London physicians opposed the theory. "They are as a class very conservative and slow to accept new views." And consulting physicians have not the same opportunity as general practitioners to watch the course of the disease.

The above should be enough to convince the most sceptical, obdurate and prejudiced that consumption is a disease communicable from one person to another—or that it is, in short, infectious. Notwithstanding it all, however, and a great deal more, there are some doubtful ones who allow their doubts to be strengthened by negative evidence; such as from the "Brompton Consumption Hospital" (London Eng). There, for many years, about 200 beds have been constantly occupied by consumptive patients in various stages of the disease, and very few of the nurses or attendants have suffered from it. The fact is, nurses usually appear to be so constituted and habituated as to be particularly exempt from all infectious diseases. They know well how to preserve their general health and vigor. In hospital the strictest hygienic rules are usually observed, as in regard to cleanliness, ventilation, disinfection, etc. Evidence of this negative kind reminds one of the Hibernian who when accused of stealing a pig, strongly protested his innocence in face of the evidence of three men who saw him steal the pig; and said he could bring "six men who didn't see" him steal it.

Every person does not "take" measles; many escape scarlet fever; and only a comparatively few suffer from typhoid fever. Of this fever, Prof. Liebermeister writes: "Physicians and nurses, who take care of such patients, are no more frequently attacked with the disease than are persons who have never seen such cases. Up to the year 1865, I have never seen in the hospitals which I visited (Griefswald, Berlin, Tubingen), a single hospital patient, physician, or nurse attacked with

typhoid fever, although such cases are placed in the general wards. Other observers have had the same experience. According to Murchison, during a period of fourteen and a half years in the London Fever Hospital, 2,506 patients with typhoid fever were treated, and, during that time, only eight cases originated in the hospital."

Although until recently many believed that typhoid fever might be brought on by overwork, anxiety and other debilitating causes, the belief is now almost universal that nothing will give rise to it in the absence of the specific germs of the disease, which must first have entered the body, and that, hence, it is infectious.

Why it is that some diseases are much more infectious than others we cannot exactly explain; though a greater degree of vitality in some specific germs than in others would help to account for the difference. And, "why it is that susceptibility to the different contagious diseases differs in different persons no one has yet arisen to explain satisfactorily, but the fact still remains unquestioned. Measles, Small-pox without vaccination, and whooping-cough, claim as victims almost everybody; while, on the other hand, scarlet fever, less exorbitant in its demands, is satisfied with perhaps half as much. Hydrophobia lays its iron grasp, according to some authorities, on only five per cent, of those bitten by the rabid animal, and even those authorities who go to the other extreme do not claim more than fifty-five per cent. These diseases are indisputably contagious. Why this difference? We cloak our ignorance by saying that the susceptibility varies, which is merely another method of stating the fact that the poison finds food for its sustenance in one case which it is unable to obtain in another. An analogy we find in botany and agriculture. Some plants thrive on one soil, but refuse to grow on another."

MODES OF DISSEMINATION OF THE CONTAGION AND ITS ACCESS INTO THE BODY—TUBERCULOUS FLESH AND MILK.

In the words of Fleming (Veterinary Science, Vol. ii). "At present we only know that inoculation and feeding by the stomach with tubercular matter will produce the disease in animals. No other modes of access have been tried, so far as I am aware; though several veterinarians have held the opinion that the disease could be induced by healthy animals breathing the expired air of phthisical ones. This pulmonary mode of access has been for a long time considered possible in mankind. Villemin, for instance, is of opinion that transmission of the malady in the human species takes place most frequently by the dry expectorated tubercular matter being accidentally reduced to powder, and carried by the atmosphere into the lungs. Veterinary surgeons have believed that forage, soiled by the expectorations of the diseased and consumed by healthy animals, will communicate the malady."

The period of incubation (the time elapsing between the reception of the contagion and the first manifest symptoms of the disease) does not appear to be well defined. From ten to twenty days after inoculation tubercles have been found in the lungs: and the interval may be said to extend from a week to some months, before any very marked symptoms of tuberculosis appear.

Gerlach, of the Berlin Veterinary School, Chauveau, of the Lyons Veterinary School, Leisering, of the Dresden School, Bollinger, of the Zurich School, Zuru, of the Veterinary School in Jena, Gunther, Harris,

and lastly, Villemin, one of the highest authorities, have successfully inoculated rabbits, Guinea-pigs and other animals with tubercular matter and so produced the disease in these animals, and also, by mixing tubercular matter with the food they have demonstrated that the disease may be readily communicated through the digestive organs.

Chauveau fed calves and young cattle on tubercular matter, and so produced tubercular disease in them. And Zurn fed pigs, first with milk, and then with flesh of a consumptive cow, and produced the disease in them.

"Gerlach, of Berlin, thus describes the results of his experiments :

1. The tuberculosis of cattle is very infectious.
2. The tubercles covering the serous membranes, as well as those in the other organs, are as infective, and produce the same tubercles as the tuberculous matter of the lungs. The identity of pulmonary phthisis of cattle and general tuberculosis cannot be doubted.
3. Infection can be produced after inoculation, as well as after ingestion, of the tuberculous matter.
4. The *flesh* of animals affected with tuberculosis possesses, in certain conditions, the power of infecting, though to a less degree than the tuberculous matter.
5. The temperature of boiling water destroys the infective principle; though boiled tubercles often, nevertheless, preserve a certain degree of virulence. It is in this as in trichinosis. Although the temperature of boiling water, or even a lower temperature, destroys the parasites, yet there may be found in the centre of the boiled flesh living trichinæ; muscle being, in general, a bad conductor of heat, and the high temperature only reaching its interior after some time has elapsed. Gerlach experimented with uncooked milk, and asserts that the infective properties of this fluid can no longer be doubted or denied; milk from tuberculous cattle will produce phthisis in creatures fed upon it.

"Bollinger, of Zurich, has made nineteen experiments, the results of which led him to the following conclusions:—1. Tuberculous matter obtained from man and inoculated in the dog, produces a typical miliary tuberculosis of the pleura, lungs, liver, and spleen. Inoculations on carnivorous animals in general are negative, or only produce an insignificant local reaction. 2. The inoculation and ingestion of tuberculous matter from the ox produces, in herbivorous animals (goats), tuberculous infection in two forms,—miliary tuberculization of the peritoneum, and caseous deposits in the intestinal mucous membrane, as well as in the mesenteric glands. 3. The contents of the bronchia of the tuberculous lungs of an ox produce the same effects as the caseous matter of the lungs, when inoculated or ingested. 4. The ingestion of fresh tuberculous matter from the ox has no effect on carnivorous animals; with herbivorous creatures, on the contrary, it produces intense tuberculous infection. 5. The tubercle virus is active in small doses; twenty to twenty five grammes of tuberculous matter from the lungs may kill such creatures as the goat, in two months. 6. The ingestion of pus alone from the caseous lesions does not produce tuberculosis in the goat. 7. Certain forms of tuberculosis induced by the ingestion of tuberculous matter present, in an anatomical and pathological point of view, a great analogy to human scrofula, and, like it, are manifested by caseous degeneration of the glands of the mesentery and neck.

"The experiments of Villemin, Chauveau, Klebs, Gerlach, Bagge, Semmer, Gunther and Harms, Zurn, Biffi, and Vergad, and some person-

al experiments previously made, are quoted by Bollinger, who arranges them under four heads or sections, as follows:—1. Ingestion of tuberculous matter obtained from man. In two pigs and two rabbits, a negative result. In one pig, enlargement of Peyer's patches, and mesenteric glands, and caseous degeneration of portions of these. 2. Ingestion of tuberculous matter from the ox; fresh glands, caseous matter, the contents of the bronchia. Animals experimented with: five sheep, two goats, four pigs, eight dogs, a large number of cats, twenty rabbits, one porpoise, eight pigeons. A negative result with the dogs and cats; nearly always a positive result with the pigs, sheep, and goats. Most frequently, with these animals, there was caseous degeneration of the intestinal mucous membrane, mesenteric glands, sometimes the cervical glands, and the lungs. 3. Ingestion of the *flesh* from phthisical oxen, or those artificially infected. Positive result in three pigs; general tuberculosis or alterations in the lymphatic glands. 4. Ingestion of the milk of a tuberculous cow. Three pigs, three calves, one sheep, two goats, two cats, and fourteen rabbits. In the three pigs miliary tuberculosis, and lesions analogous to those of scrofula; in the two cats, a negative result. A positive result in two rabbits; a negative result in fourteen rabbits fed with the boiled milk.

"Bollinger thinks it possible, or rather probable, that intestinal tuberculosis, consecutive to pulmonary phthisis, may be produced by the sputa being swallowed and passing into the intestines. He also thinks it proved that scrofula and tuberculosis are only two forms of the same disease, at different periods of development.

"Klebs has been successful in producing tuberculosis by giving animals milk from those which were diseased, and his experiments, therefore, have an extremely important bearing. In addition to rabbits and guinea-pigs,—creatures which appear to be very susceptible to the artificial production of the malady,—he accidentally induced the disease in a dog by feeding it with the milk of a cow in the last stage of phthisis. The results of his experiments led him to the conclusion that the use of this milk always produces tuberculosis, which commences as an intestinal catarrh, and then assumes the form of tubercles in the mesenteric glands; it afterwards affects the liver and spleen, and subsequently the thoracic organs. He asserts that the tubercle virus is present in the milk of phthisical cows, whether they are slightly or gravely affected; and that it chiefly exists in the serous portion, as when milk has been so filtered as to deprive it of its solid particles, the fluid portion appeared to be as active as when the malady had reached an advanced stage in the animal from which it had been procured.

"The commencement of phthisis is generally so insidious in the human species, that it is most difficult to arrive with any degree of certainty at the causes which directly produce or favour its development; but from the evidence before us, it is to be feared that at least one of its sources may be referred to this fluid. It is certain that tuberculosis is a somewhat common and a very destructive disease, among dairy cattle especially, and more particularly those in towns; that the udder is one of the glands not unfrequently involved; that infants and adults consume milk in large quantities—indeed, it is the staple diet of young children; and that phthisis is a very prevalent and fatal malady in the human species, and chiefly among the dwellers in towns and cities.

"There is every reason, then, to prohibit the use of milk from cows affected with tuberculosis, and especially for infants, who mainly rely upon this fluid for their sustenance, and whose powers of absorption are very active. Even if it did not possess infective properties, its deficiency in nitrogenous elements and fat and sugar, and the increased proportion of earthy matters, would alone render it an objectionable article of diet. It had long been known that it was liable to produce diarrhœa and debility in infants; but though these died from general or localized tuberculosis, the part played by the milk in its production was not suspected. (Reports, and Veterinary Science, by Geo. Fleming, F. R. G. S., &c.)

The *British Medical Journal*, of July 31, 1880, narrates the results of some experiments which M. Puech reported to the Académie des Sciences, Paris. A cow which had been sold to the butcher to be killed, still continued to give three or four litres of milk every day. Discovering that the cow was affected with phthisis, he fed two sucking-pigs and two rabbits with her milk. These animals, when killed, showed tubercular deposits in strict proportion to the length of time the milk had been administered. The post-mortem examination of the cow confirmed Puech's diagnosis.

- "The question as to whether there is any danger in permitting the flesh of tuberculous cattle to be consumed as food, is of great moment. Until further researches have furnished us with information on several matters connected with this important subject, we can only, with any confidence, offer the following as a summary of what should be the rule at present.

"Any organ or texture in which tubercle is deposited, as well as tubercular matter of any description, should not be considered fit for food. As we have no proof that the bones or muscles are usually the seat of tubercle, unless, perhaps, in very advanced cases of the disease, these may be utilized, if otherwise in a healthy condition. This relaxation in a sanitary point of view, is almost urgently demanded until we have absolute proof of the noxiousness of such food; as the number of phthisical cattle sent to the slaughter-house is generally very large, and the condemnation of such a quantity of flesh would be a serious economical sacrifice, and one which could not be justified by our present knowledge of the disease. For it must be borne in mind that there are few animals which have been kept for any length of time in cowsheds, and fed and milked in the usual manner, which are not more or less phthisical; more particularly is this the case if the dwellings are bad.

"Van Hertson gave an instance, occurring in Belgium, of a bull seven years old, and apparently in good health, which, after slaughter, was found to have numerous tuberculous masses in different parts of the body, but especially in the subcutaneous cellular tissue and in the muscles. Uncooked blood, should not be utilized as an article of diet; its employment as a remedial agent for the human species demands care in this respect.

"Of course, the flesh of cattle in an advanced stage of phthisis must not be consumed, as, in addition to the risk of its unhealthiness, it is of very inferior quality. (Fleming's Vet. Sci.)

"Creatures drinking from the same ponds or troughs, or confined in the same stable, or eating side by side in the pasture, are, according to Chauveau, constantly liable to swallow the sputa or other secretions of their comrades, which, if phthisical, may thus infect them. Mankind,

too, may easily acquire the disease by eating the flesh and organs of phthical animals, which are every day sold in the public markets without suitable governmental inspection, or by drinking the milk of diseased cows, there being at present no restrictions on the sale of such milk. (H. C. Clapp, A. M. M. D., &c., on contagiousness of consumption).

PERSONAL HABITS AND SURROUNDINGS OF LIFE.

Personal habits and the general conditions of life, after all, have more to do with the development and progress of consumption, in the great majority of cases, than either heredity, commonly so called, or contagion. In other words, the disease will but rarely indeed develop in one whose habits of life are in every respect correct.

Dr. Alfred Carpenter has put forth the hypothesis, that in all zymotic or infectious diseases, there are three factors: one, the specific contagium—the essential germ; another, the meteorological condition of the atmosphere; and a third, an excess of used up or waste matters in the fluids of the body. This last factor arises from the waste matters having been but imperfectly removed from the body by the excretory organs—the lungs, skin, kidneys, liver. He doubts if the contagion of disease would have any effect upon the body if the recipient of the contagion were in a perfectly healthy condition—if there were no impurities, no excremental matter, in the fluids of the body. We are fully in accord with this view. This would explain, too, why it is that the parasite ceases to grow and multiply in the body after a certain period of time in cases of recovery from the disease.

Of the causes which may be enumerated under this head the principal are the following: Impure air—more especially air which has been once breathed, as in unventilated rooms; improper diet; excessive labor—mental or physical; deficient exercise or idleness; mental depression; improper clothing; intemperance in the use of spirituous liquors or any other excesses, especially with exposures; want of sunlight; and any causes which depress and debilitate the system. A humid atmosphere favors the development of consumption, and a residence on a damp, undrained soil or in a damp house is often an important factor in causing the disease.

IMPURE AIR, in unventilated apartments, is, perhaps, of all exciting causes, the most important—the most common cause, of this disease. A celebrated French physician, Baudelocque, writes that, the repeated respiration of the same atmosphere is a primary and efficient cause of scrofula—consumption being one of its most common forms; and that invariably it will be found on examination that a truly scrofulous disease is caused by vitiated air, and it is not always necessary that there should have been a prolonged stay in such an atmosphere. Often, a few hours each day is sufficient; as sleeping in a confined room when the air has not been renewed. Large numbers of the pupils at a school in Norwood, England, some years ago, fell victims to scrofula, and on investigation it was decided that insufficient ventilation and the consequent atmospheric impurity was the cause. Twenty years ago, consumption was very prevalent among the British soldiers. A sanitary commission, consisting of men of the highest standing, after investigation, declared it was caused by over-crowding and deficient ventilation;—in other words, by re-breathing breathed air. When this cause was removed,—more space in barracks and better ventilation

provided—the number of cases of this disease materially diminished (Playter's Physiology and Hygiene).

A great many facts are upon record which prove that the re-breathing of breathed air acts a most important part in the development of consumption.

IMPROPER DIET.—Among the causes of consumption, Sir James Clark writes, "imperfect supply of food holds a conspicuous place. But we have rarely an opportunity of seeing the effects of this alone," he adds, "because when the means of procuring proper nourishment are wanting, there are generally other causes of the disease in action at the same time; such as residence in ill ventilated and dark apartments, exposure to cold from imperfect clothing, &c.; the whole of which are often combined, and hence more speedily effect the deterioration of the health. Food in excess, or of a kind too exciting for the digestive organs, may also induce tubercular cachexia,—a circumstance which is not sufficiently attended to,—we may say not generally understood, even by medical men: nevertheless we hold this to be a frequent cause of scrofula and believe that it produces the same effects on the system as a deficient supply: the imperfect digestion and assimilation in the one case and the inadequate nourishment in the other, being equally injurious: the form and general characters which the disease assumes may differ, but the ultimate result will be the same in both cases. The adaptation of the food, both in quality and quantity, to the age of the individual, as well as to the powers of the digestive organs, is too little considered; and the evil consequences of this neglect are often evident in the children of the wealthy classes of society, who are frequently allowed an unrestricted use of the most exciting kinds of animal food."

OF OTHER CAUSES, it is difficult to say whether continued over exertion or deficient exercise ranks next, as a cause of this disease. Amongst the poor, in their struggles for existence, and sometimes amongst the well-to-do in their struggles for wealth, excessive labor prostrates the vital powers until there is not vigor enough in the body to enable it to resist the invasion of the immediate specific cause of the "fell destroyer." So it is with idleness or inactivity, a like effect is produced and like results follow. Too close application to study frequently operates as a cause, chiefly from want of physical exercise. And it is not difficult to understand how deficient or improper clothing, the abuse of alcoholic liquors, or any depressing habits, may so reduce the bodily vigor as to make it an easy prey to tuberculosis.

CAUSES OF THE DISEASE IN ANIMALS.

The causes of this disease in animals are almost precisely of the same nature as those which give rise to it in man, and from what has been already stated in relation to these, they may be readily understood, yet a few words under this head may be of practical use.

The evil effects of heredity, for example, while they may be intensified and increased by the selection, for breeding purposes, of a certain animal already slightly predisposed to the disease from hereditary defects, they may, on the other hand, be much more readily prevented or lessened in animals than in man. Men and women will marry and procreate the species in spite of even strong predispositions to disease from constitutional defects, and there is no law, nor way, and probably

never will be, to prevent them. The procreation of domestic animals, on the other hand, is entirely controllable.

It is desirable to draw attention to the question, whether the high development of the milking qualities in cows may not operate injuriously on the respiratory functions, by reducing the respiratory capacity while increasing the powers to supply milk, and thus intensify the tendency to tubercular disease. The frequency of consumption in milch cows would seem to favor the belief that a predisposition to the disease may be gradually brought about by the super-development of the lacteal organs and functions. This is a question which seems well worthy of consideration and investigation. The writer has made enquiries relative to the subject, but has not been able to obtain any satisfactory information nor to learn that any attention has been directed to it by stock growers. Certainly the respiratory capacity, as well as that for milk supply, should receive full consideration from the stock grower.

In relation to the contagiousness of consumption among cattle, the following extracts from Cruzel; on diseases of cattle, will be interesting and profitable (translated by Geo. Fleming, M. R. V. C. S. &c., British and Foreign Medico-Chir. Rev.; from Dr. H. C. Clapp on contagiousness of consumption).

"Much has been stated with regard to the danger animals incur by being kept in low, narrow, and badly ventilated buildings, and this danger is real; it exist, and may be remarked every day. But all has not been said with regard to this matter when treating of tubercular phthisis. If in a cramped, low stable, in which several milch cows are lodged, there chances to be one with this disease, and if the tubercles are in a state of ulceration and suppuration, so that the air expired from its lungs is very fetid, then this air inspired immediately by another cow carries into its healthy lungs the tubercular infection..... It is in this way that tuberculosis is communicated by the expired air, and the facts which support this opinion are numerous. Those veterinary surgeons who practise in the country may gather them every day.

"Viseur, of Arras, in 1868, endeavored to explain the persistence of the malady in certain establishments, well kept in every respect, but in which the cattle were slowly decimated, and in which hereditary transmission could not be included as a cause of the mortality, as breeding was not carried on in them. In some of these places the malady had lingered for years, and had affected animals of all ages, but not until after they had been a certain time in the sheds, and in contact with the consumptive milch cows."

"Zundel, one of the most talented of the [continental veterinarians, has also commented on the frequent persistence of bovine phthisis in Alsace, in stables well kept and carefully ventilated; and this persistency, he is inclined to believe, can only be attributed to contagion. He alludes to certain establishments in the vicinity of Mulhouse, where, notwithstanding the greatest care in purchasing, and good hygiene and regular feeding, the healthiest animals become affected with the disease after dwelling for a certain time in the stables. Most frequently these are the strong and vigorous Swiss cattle, which, in the words of Zundel, 'do not pay their tribute to acclimatization, as certain people appear disposed to believe, but are in the stables under the influence of a contagion that the owners cannot comprehend, and look upon as a fatality to which they must submit. And yet other animals from the

same country, and kept in sheds often less attended to, remain healthy for years.'

"The evidence of M. Grad, veterinary surgeon at Wasselonne, Alsace, is still more significant and decisive, as it not only furnishes us with clinical observations, but also an experimental fact which adds a great value to the others, while it receives additional weight from them. The observations are guaranteed as perfectly authentic, and were collected during a period of twenty-three years' practice as a veterinary surgeon. At the commencement of his professional career, Grad does not appear to have believed in the possibility of tuberculosis being transmissible amongst bovine animals by cohabitation, but the close observance of a series of facts at length confirmed him in the opinion that it was. In order that the circumstances in which the transmission of the disease was most frequently noticed might be understood, this veterinarian describes the arrangement of the cattle-sheds of the farmers: and it would appear that the animals are generally kept in very short stalls, which completely separate the animals from each other, from the rack and manger, to one third the width of the shed. This arrangement, while preventing the cattle from injuring each other with their horns, as they cannot reach one another with their heads, also permits their allowance of food to be given separately. On different occasions, owners had informed Grad that they had lost two, three, and four animals *in the same stall*, from consumption,—marasmus, accompanied by cough. At first he did not attach any importance to these declarations, either because he thought the mortality occurring in this way was merely accidental, or was due to hereditariness, which he acknowledges plays such an important part in the production of the malady. However, one day, when visiting the stables of an extensive farmer at Leinheim, he was informed that every year for five years one of the cattle had died from phthisis; 'and what is very curious,' said the farmer, 'this always happens in the same stall.'

"In proof of this, Grad was shown a young cow, which on examination, offered all the symptoms of tuberculosis; such as excessive emaciation, skin clinging closely to the bones, frequent and feeble cough, etc. Its value in this condition was from thirty to forty francs. According to the farmer, the animal had been ten months in the stall, and when first placed therein it was in flourishing health; it was the fifth cow that had fallen into the same state in this stall. Grad's attention could not but be strongly aroused by this report; nevertheless, he expressed his opinion that an hereditary tendency was doubtless the efficient cause in this succession of losses. Such, however, was not the opinion of the farmer, and it was at length agreed that Grad should choose a cow from another stable and put it in his stall, as an experiment. With this object a cow three years old, and in calf, was selected; it had every appearance of perfect health, had been bred on the farm, had never been unwell, had never coughed, and none of its progenitors had been affected with tuberculosis. It was moved into the stall, and remained quite well until after calving, when a short cough was the first symptom observed. This cough increased in frequency, and emaciation gradually set in, with the usual *cortège* of symptoms accompanying tuberculosis distinctly marked; so that in about twelve months the creature was only the shadow of its former self, and was sold for a trifle, like the others which had preceded it in the stall, to the low-class butchers. Grad could no longer resist the

evid
with
bilit
expe
place
remo
spot
and
no m
vatic
the
firme
disea
as th
the p
no
occu

sump
of tr
any
mani
of hu
the g

festec
no sp
preve
one y
more
strike
meas
this i
while
it wit
huma
its se

consi
were
mean

to o
ings
other
perv
is a c
natur
favor
all tr

evidence in support of this cause, this being the sixth animal attacked with tuberculosis in the same stall; and he inferred that in all probability the disease had been transmitted by the ingestion of the matters expectorated by the cattle which had previously inhabited the same place. On his recommendation, all the woodwork of the stall was removed, the manger and rack were thoroughly disinfected, and the spot left unoccupied for a certain time. When the stall was rebuilt, and again occupied by several animals in succession, tuberculosis made no more victims either in it or other parts of the stable. This observation was made fifteen years ago, and since then Grad's opinion as to the transmissibility of tuberculosis has, he asserts, been amply confirmed; and the examples he could adduce of the conveyance of the disease by inhabiting a *contaminated stall* are numerous, and as patent as that just related. For a number of years he has recommended that the places occupied by phthisical animals should be disinfected; and in no instance in which this was adopted had cases of transmission occurred, no matter how numerous they may have been previously.

PREVENTION OF CONSUMPTION IN MAN.

This is the ultimate object of this pamphlet—the *prevention* of consumption. After the disease has become fully developed, and masses of tuberculous matter have been deposited to a considerable extent in any vital organ, especially a lung, so that physical signs become manifest, it is then in almost every case practically beyond the limits of human skill to cure, or even to very much retard its progress; hence the great importance of prevention.

It is fearful to contemplate the carelessness and indifference manifested with reference to the prevalence of this terrible malady and that no special means have heretofore been adopted to stay its progress or prevent it. If the same amount of mortality caused by consumption in one year were brought about in a month or two by some epidemic, or more plainly contagious disease, with a brief period of sickness, panic-stricken citizens would flee before it and from their homes, and active measures would be enforced to check its spread. "But it is not so with this insidious flatterer; as by stealth it fastens itself upon the victim while all around appear to be unconscious of its presence, and look upon it with as much careless complacency as though it as much belonged to humanity as the ravages of time itself." And so it stalks on, counting its several thousands of victims yearly in Canada alone.

The means of preventing consumption may be most conveniently considered under three heads similar to those under which its causes were considered, viz: heredity, contagion, and special individual means in connection with habits of life.

PREVENTION AS IT RELATES TO HEREDITY.

While constitutional organic defects are transmitted from parent to offspring and under unfavorable hygienic habits and surroundings become gradually intensified from generation to generation, on the other hand, the deviations from normal conditions and types, and perverted processes, are subject to a limitation in transmission, and there is a decided tendency in organized structures to revert to the previous natural condition, and even an improved one, under improved and favorable hygienic environments, and in a few generations to eradicate all traces of such organic defects and predispositions to disease. All those

especially therefore who inherit any predisposition to consumption, the offspring of consumptives and those nearly related to tainted families, should early in life be placed as far as possible under a strict but most judicious hygienic regime. This should particularly comprise and secure abundance of outdoor life, plain but nutritious food, clothing suitable for all seasons—in order to secure correct functional activity of the skin and kidneys, and regular habits of life in every respect, of which more will be written further on.

When in Montreal recently, at the annual meeting of the Canada Medical Association, Mr. Lawson Tait, of Manchester, England, the celebrated surgeon in abdominal operations and a member of the "British Association" which this year met in Montreal, was asked, after his admirable address on "Abdominal Surgery," to what he attributed his remarkable success in his operations—an unusually large proportion of his patients recovering after most serious operations—he replied, that he could not account for it in any other way than to attribute it to his practice of constantly giving *the strictest attention to the minutest details* in every thing relating to his operations. On hearing this reply, I was particularly impressed with the importance of giving the most particular attention to details, not only in all cases of surgical, but of medical practice, including the prevention of disease, and especially as relating to the practice of health rules in our efforts to improve, invigorate and build up the constitution of individuals.

Briefly, here, by strict attention to the simple laws of health, not only will the individual system become fortified so that it will be the more able to resist the encroachments of the disease and be less liable to become a victim to it, but the whole organization will so improve as to be in a condition to produce more perfect offspring. Parents in whom there is a predisposition to the disease, should begin with the infant, and be exceptionally particular in relation to its management. Indeed those who expect to be parents should commence at marriage and give special attention to the practice of hygienic laws in relation to their own body. The result would unquestionably be beneficial to the offspring while yet unborn. That of early life is the most susceptible age, when the strongest impressions, either for good or ill, may be made, and in the readiest manner, upon the physical organization. If in case of infants at all predisposed to consumption, the parents do not at once employ hygienic preventive measures, but wait until some symptoms or signs of the disease show themselves, or even until there are appearances of general delicacy, it may then be too late. The hygienic regimen should therefore be commenced at birth. Especially should the child be much in the open air and provided with suitable food and clothing. As in consumptives one of the most marked abnormal conditions, especially in later life, is a small chest with small lungs, it is most important that all restrictions in the form of bandages about the chest of the infant be scrupulously avoided. An occasional vigorous cry if from but temporary causes will do good in the way of developing the lungs. Later in life, special means must be employed to increase the capacity of these organs.

Legislation has been mentioned repeatedly as a means of preventing the inter-marriage of those strongly predisposed to consumption and other forms of scrofulous disease. It would be very difficult to make such legislation practicable. If those thus predisposed would exercise and be guided by their judgement as well as their feelings and

affections before entering the marriage state, they would oftener hesitate and perhaps sometimes not enter that state at all. All such should consider well the serious consequences, both in relation to the object of their affections as well as their offspring, which are likely to follow their marriage, and pause and reason well and consult friends and the family physician before marrying. They should at least, by all means, wait until after the most critical period of life has passed—until the age of 28 or 30 years—and in the mean time use means to overcome as far as possible the inherited tendencies to disease, and endeavor to develop a more vigorous constitution.

HOW TO DEVELOP AND STRENGTHEN THE LUNGS.

When in their teens or after the age when they can fully understand the process, those having a chest proportionately small, should be encouraged to practice the following method of developing their lungs:

"The size of the lungs may be increased by the exercise of frequent deep inspirations. The person, out of doors in a pure atmosphere if possible, should stand perfectly erect, with the hands hanging down at the sides or resting on the hips, and then gradually and slowly draw in air through the nostrils until the lungs are well distended or filled, hold the breath for a few seconds, and then gradually and slowly expel air until the lungs again assume their natural state in expiration. This should be done three or four times or even oftener in succession; breathing naturally two or three times between each forced inspiration to rest as it were if desired. The exercise should be repeated two or three times a day. It is best to raise the arms a little from the sides during the act of inspiration. After a little practice, the inspirations should be longer and the lungs expanded to the utmost capacity of the chest; and forced expirations, too, should be practiced, in order to expel as much air as possible from the lungs.

"CAUTION.—Too much force must never be used, and at first especially care is needed in order not to strain the lungs nor even the walls of the chest. Later, much more force may be exercised. When too much force is exercised, slight momentary blindness or dizziness may follow, but this would be only very transient.

"Persons with very weak or diseased lungs or who have had any hæmoptysis (coughing or spitting of blood) must be exceedingly careful at first, and better first of all consult their physician. But I am convinced that any one not suffering from advanced lung disease may cautiously adopt the practice without risk and with great benefit.

"Besides the above special exercise, moderate running, such as will not cause much difficulty in breathing, or "loss of breath," is a very useful practice; so likewise is walking up hill; or indeed any exercise which causes long deep inspirations. As a gymnastic exercise, that of hanging by the arms to a rope or pole, just so high as that the toes only can rest on the ground, and swinging the body around in a circling way and from side to side, is probably of the greatest value.

"I have known the circumference of the chest increased two or three inches in a few months' time by the judicious practice of such exercises as above described; and never knew any harm whatever to result from the practice of any of them. (From "The Lungs and How to Preserve and Strengthen them," by the author of this pamphlet).

PREVENTION AS IT RELATES TO CONTAGION.

The principal sources of the contagion of consumption as it relates to man are two, 1st., that of individuals suffering from the disease, and 2nd., that of the milk and flesh of tuberculous animals.

That there is great danger of the disease being communicated by consumptive persons to those in good, or apparently good health, is very plain from what has been stated on previous pages of this pamphlet, especially on pages 9 and 10. In England there are special hospitals where consumptive patients are treated. But even with abundance of hospital accommodation the great majority of the afflicted would still be attended and nursed at their homes. With nurses in good vigorous health and precautions in relation to disinfection and ventilation, there would be little or no danger of the disease being communicated to others.

With strong healthy nurses, the two main points doubtless are to avoid inhaling the breathed air from the lungs of the consumptive subject, and also infected particles from dried expectorated matter. After the disease has become established, the patient should be the sole regular occupant of the room, nurse and attendants going in as often as necessary for the comfort of the patient, and no oftener. In warm weather the windows or window and door should be open constantly, and in cold weather there should be a fire in an open fire place, or a large opening in a heated stove pipe or chimney, in the room, in order that the foul air may be constantly withdrawn. Nurse and attendants when in the room should be as much as possible at the side of the patient *opposite* to that from which the air current is moving from the patient to the outlet for the breathed air; that is, not between the sick and the open window or door, fire place or other opening, through which the foul air is escaping from the room, the reason for which is obvious enough. All expectorated matter should be received directly from the mouth or nostrils into a strong solution of some disinfectant, or on bits of cotton or other rag and at once or repeatedly burned. As a disinfectant for this purpose 7 or 8 grains of corrosive sublimate, or 3 drams of sulphate of copper, dissolved in a pint of hot water answers very well. These are very poisonous substances, as are most disinfectants, and are better kept in a dry state than dissolved, and it is therefore safer to dissolve only a small quantity from day to day. This quantity, half filling a quart vessel, would be enough for 24 hours unless the discharge from the lungs were very profuse. I much prefer the practice of using bits of old soft cotton to take the expectorated matter directly from the mouth, with the burning of the rags before it has had time to dry. All spoons, cups and other vessels used by the patient in taking food, before being taken from the room, should be placed for a short time in a disinfecting solution (water, 1 qt.; zink sulphate—white vitriol, 1 oz.; common salt, $\frac{1}{2}$ oz.) and then washed in clean water, best and easiest by holding them over a vessel and pouring water on them from a spout.

With such precautions, and repeated change of the bedding, bed and under clothing of the sick, and the careful washing or exposure for hours to sun and air of all such articles, there would be comparatively no danger from infection in this disease, or, indeed, with like care, in any other disease. Such precautions when properly provided for are not at all difficult to carry out, and seem much more formidable on paper than in actual practice.

Great care should be exercised in selecting nurses for children, especially infants, as shown by the case reported by Dr. Wilson, at page 10. There is doubtless danger of communicating the disease as soon as tubercular deposits take place in the lung, and when the consumptive is going about, seemingly but little the worse. Such persons should exercise care in order to avoid communicating the contagion to others, and others should be equally careful in order not to receive the contagion.

It is extremely probably that consumption may be communicated to the human organism by means of the flesh and milk of tuberculous animals, and cases are on record of such communication by means of milk. The means of preventing such communication is obvious—being simply that of abstaining from the use of such contaminated foods, which would be easy enough were it possible to always recognize them, which it is not. In country places in Canada there is probably little or but rarely danger. In cities and towns however it appears it is a common practice for dairy men, or milk dealers, to buy in the fall poor, old and doubtless often diseased milch cows, milk them during the winter, and at the same time fatten them, and in the spring to sell them to the butcher. In the early stages of the disease, Fleming says, the animals will give milk and fatten as if quite well. While in late stages the flesh may be known by its watery, pale, bloodless condition, with the fat dirty looking, soft and yellowish, and the milk by its bluish, watery appearance, in the early stages the flesh and milk may not have changed appreciably in appearance; and in the case of milk, when a dealer mixes that from a badly diseased cow with that from several healthy cows, the contamination cannot well be recognized.

A system of inspection of flesh meat and milk and dairies will soon become such a necessity for the public safety that it cannot be dispensed with. Until such is established, individuals themselves, who are liable at any time to have the seeds of death implanted in them or in their children by dishonest or perhaps only ignorant dealers, can only look out for themselves by exercising caution in regard to the supply of these foods.

PREVENTION AS IT RELATES TO HABITS AND SURROUNDINGS OF LIFE.

Although the means of preventing consumption which properly come under this head are on the whole of much more importance than any others, they relate to ordinary hygienic rules with which most people are familiar, and much need not be said here, especially as already they have been in this pamphlet pretty plainly indicated. If all who are predisposed to this disease, would steadily and persistently simply follow the advice comprised in the following five little words:—

LIVE IN THE OPEN AIR,

the number of deaths from consumption would soon be reduced in a very marked degree; and if with an out-door life they would take a fair amount of physical exercise, use plain nutritious food, attend to the functions of the skin by means of the bath and suitable clothing, and use means to expand the lungs, as elsewhere described, it is safe to say that the mortality from the disease would be reduced in five years to *one half* if not *one fifth* of what it now is. But it must be observed that remaining 7 or 8 hours in every 24 in an unventilated bed-room is not living in the open air. Sleeping every night in such a room would

indeed counteract the good effects of the out door daily life. An opening from 4 to 8 inches in diameter in a warmed stove pipe or chimney flue passing through a bed room will keep the air of the room, especially if occupied by only one person, fairly pure by drawing off the breathed air: in a hot stove pipe or chimney with a strong draft, a small opening will suffice, in a cooler one, a larger opening is required. If the temperature of the bed room is kept above 50° F., in cold weather enough fresh air will usually force its way into the room through the cracks and crevices around windows. In warmer weather a window should be opened or some other inlet provided. It is a great mistake to fear when in bed mild drafts of "night air" and keep out the fresh air. Care should be observed that the air be not brought from another occupied room.

The benefit sometimes derived by consumptives from moving to a warmer climate is because there they can remain much in the open air. There is not however probably more than one in a hundred predisposed to consumption who could not accustom themselves to an out-door life in almost any part of Canada, and with greater benefit than in the south, as the air is more invigorating here than in a warmer climate. Cool bathing, flannels and habit would soon overcome any evil effects of the cold and sudden changes in this climate.

A diet of flesh meat, in moderation, milk, fruits, vegetables, and plain puddings, with as much butter, cream and other fatty foods as are relished, is the best. All eaten very slowly, immoderation is not likely to be indulged in. All pastry, cake, confectionery, sauces and pickles should be strictly avoided. The foods eaten should be all of the best quality, and little or no pork should be used.

The strictest temperance should be observed in *all* things, and *all* debilitating habits persistently abstained from.

PREVENTION OF THE DISEASE IN ANIMALS.

Under this head but little is required. The following is about all that Fleming gives in relation to prevention (Fleming's Vet. Sci., Vol. 11 p. 392)- "The only preventive measures with which we are acquainted, are those of a hygienic kind; proper food and water; sufficient exercise in the open air; clean, dry, and well-ventilated, but not too cold stables; and keeping the cattle from undue exposure to severe weather. As there is reason to believe that the malady is hereditary, cattle having any tendency to it should not be bred from.

"There being much reason to believe that the disease can be transmitted by cohabitation, whenever cattle show any tendency to it, they should be isolated from the healthy, and every precaution observed with regard to preventing contact. Animals slightly affected might be fattened and slaughtered, and their flesh, if free from traces of the disease, may be utilized. The milk of such animals should be proscribed, and in advanced cases the flesh also."

Consumption is more common it appears amongst the more valuable breeds of cattle because in cold weather these are more generally housed in close stables and are not allowed to run at large in the open air as much as the common cattle are.

Every where we find evidence, amongst both the human species and domestic animals, that breathed air is an important factor in causing consumption, and that an out-door life, or the perfect ventilation of indoor apartments, is the best preventive.

In concluding what I have herein written—with a hope that it may be instrumental in prolonging some valuable lives—I desire to urge upon all you readers who are at all predisposed to this most fatal disease to follow some out-door occupation, requiring considerable physical exercise, proportioned to the previous habits and vigor of the individual ; to take into the lungs abundance of pure fresh air ; to sleep only in a well ventilated bed-room ; to eat only plain, digestible, but good and nutritious foods, well masticated ; clothe warmly, when necessary, and attend to the functions of the skin and bowels ; abstain from all debilitating habits ; and lead a strictly temperate and regular life. Do these things and consumption will not be at all likely to give you any trouble nor to shorten your life.